(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 736 278 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.10.1996 Bulletin 1996/41

(51) Int Cl.[6]: **A47C 27/08**

(21) Application number: **96302415.3**

(22) Date of filing: **04.04.1996**

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **07.04.1995 US 418765**

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(54) Inflatable cushion

(57) An inflatable multi-layer body support cushion (10), adapted to buffer or dampen the fluid reaction to forces applied to the upper surface of the cushion (10), includes a plurality of adjacent cells (12) of generally hourglass configuration defined by vertically stacked upper and lower chamber portions (14, 14') and medial neck portion (18). The laterally adjacent chambers (14, 14') are interconnected for the intralayer fluid flow therebetween. The vertically adjacent chambers (14, 14') are interconnected in the neck portion (18) of the cells (12) by orifices (22) which control the interlayer fluid communication between the upper and lower chambers (14, 14').

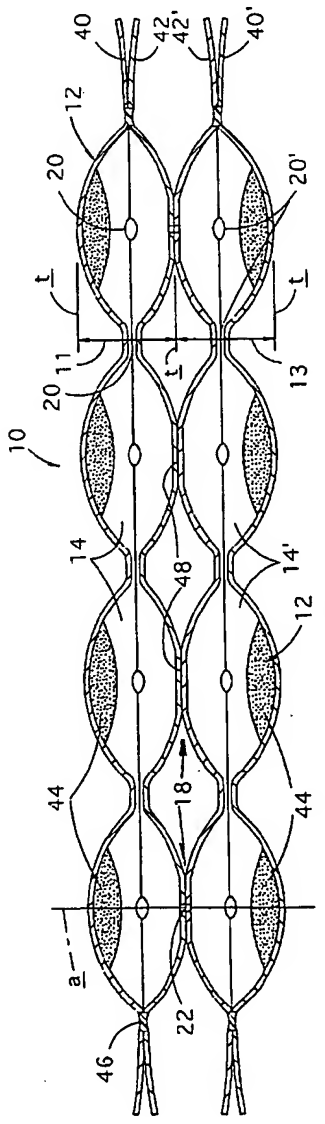

FIG. 3

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Description

This invention relates to body support cushions and, more particularly, to multi-laminar cushions composed of laterally adjacent cells adapted to be inflated with fluid and having vertically stacked upper and lower chambers, with differential fluid communication provided between the cells and chambers that serves to buffer the reaction of the cushion to a force applied downwardly on the upper surface thereof.

Inflatable cushions are typically used for low impact applications, such as seat cushions and mattresses; or for high impact applications, such as padding to protect packages during shipment thereof.

Individuals who are confined to a bed or wheelchair for prolonged periods of time are susceptible to developing lesions in the nature of bed sores on the more vulnerable parts of their bodies. These individuals require a stable cushion or mattress that provides generally uniform pressure over the area of the cushion in contact with the individual's body.

When a cushion is used for low impact applications, such as for sitting in a wheelchair, it is desirable that the pressure in the cushion be such as to provide a relatively soft seating surface and yet one that is not overly responsive to sudden movement of the body thereon. It has been learned that when a person moves about on the upper surface of the cushion, a fluid reaction known as "surging" can result in a sudden collapse of the cushion in one area with a resultant rebound or commensurately rapid inflation in another area of the cushion. As a result of such surging and rebound, it is not unusual for the patient to get a feeling of bodily instability and discomfiture.

The seat cushion disclosed by Morner in U.S. Patent No. 2,495,124 comprises two layers of adjacent inflated cells. Each cell is self-contained and does not communicate with any of the other cells. This type of cushion which does not provide for fluid flow to adjacent cells is unable to evenly distribute the pressure in the cells thereby localizing pressure to the user's body and which may result in bed sores.

The seat cushion disclosed in U.S. Patent No. 2,434,641 attempts to resolve the problem of individuals developing skin lesions from sitting for protracted periods of time on air support cushions. In the '641 Patent a plurality of bellows of various diameters disposed in the cushion are interconnected. Unfortunately, cushions of this type would be most complicated to manufacture and very costly to manufacture.

U.S. Patent No. 5,030,501 discloses a protective material comprising a plurality of polygonal air-filled cells which are stiffly resilient and interconnected by a stratum or layer of channels to absorb the air displaced by an impact or blow delivered against one or more of the cells which are collapsed as result of the impact thereon. The venting of the cell(s) is for the purpose of reducing the rebound caused by such impact.

None of the prior art disclosures relate to body support cushions capable of omnidirectional buffering action but are limited to uniplanar fluid transference.

There is a desire to provide an inflatable multi-laminar cushion that overcomes the drawbacks of the prior art.

There is also a desire to provide an inflatable multi-laminar cushion constructed to buffer the reaction of the fluid flow caused by a force applied to the cushion.

There is yet another desire to provide an improved method of forming an inflatable multi-laminar cushion in a single sealing operation.

According to the present invention, an inflatable cushion of multi-laminar construction is composed of a plurality of laterally adjacent or contiguous cells. Each of the cells is generally of hourglass configuration defined by vertically stacked inflated upper and lower chamber portions and medial neck portion. The upper and lower chambers of the cells are disposed in separate layers of the cushion and conduits are disposed to provide intralayer fluid communication at a given flow rate between the upper chamber portions and adjacent cells and between the lower chamber portions and said adjacent cells. Orifices in at least some of said cells which provide interlayer communication directly between at least some of the upper and lower chamber portions and at a different flow rate than said given rate so as to buffer fluid reaction to forces applied to the upper surface of the cushion in a generally downward direction.

The invention will now be described in more detail by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an inflatable cushion of the type which embodies the present invention;

Fig. 2 is a top plan view of the cushion of Fig. 1;

Fig. 3 is a cross-sectional view taken along the line 3-3 of the cushion of Fig. 1;

Fig. 4 is an exploded perspective view illustrative of the method of manufacture of a cushion of the type embodying this invention;

Fig. 5 is a top plan view of an alternative embodiment of the cushion of Fig. 1;

Fig. 6 and 7 are top and bottom plan views respectively showing another alternative embodiment of a cushion of the type embodying this invention;

Fig. 8 is a top plan view of yet another alternative embodiment of a cushion of the type embodying this invention;

Fig. 9 is a cross-sectional view taken along the line

9-9 of Fig. 8;

Fig. 10 is a top plan view of still another alternative embodiment of a cushion of the type embodying this invention;

Fig. 10A is a cross-sectional view taken along line 10A-10A of Fig. 10;

Fig. 11 is a perspective view of a sixth alternative embodiment of a cushion of the type embodying this invention;

Fig. 12 is a sectional view taken along line 12-12 of Fig. 11;

Fig. 13 is a top plan view of a seventh alternative embodiment of a cushion of the type embodying this invention;

Fig. 14 is cross-sectional view of a cushion of the type embodying this invention being used in a manner to illustrate the buffering action of a cushion of the type embodying this invention;

Fig. 15 is a top plan view of an eighth alternative embodiment of a cushion of the type embodying this invention, and

Fig. 16 is a top plan view of an orifice of a cushion of the type embodying this invention.

An inflatable cushion **10** of the type embodying this invention is shown generally in Figs. 1-3, which is adapted for low impact applications, such as seat cushions, mattresses and the like. Cushions of the same construction may also be adapted for high impact applications, such as protective padding for the soles of shoes and for other types of sporting equipment. As shown, the cushion **10** comprises at least two superimposed and coextensive layers **11** and **13**. Each layer is formed by two thermoplastic sheets **40'** and **42'** selectively sealed, as will hereinafter be more fully described, so as to define by discrete, vertically oriented fluid-filled cells **12**. Each of the cells **12**, as shown, may be of generally hourglass configuration defined by vertically superposed, or stacked, upper and lower chamber portions **14** and **14'** bonded together at their adjacent and central points of tangency which define a medial throat or neck portion **18** disposed therebetween.

As seen in Figs. 1-3, those cells **12** which are horizontally adjacent to one and other and include peripheral edge portions **46** that are disposed in contiguous or abutting relationship. When the cushion is inflated, as shown in Figs. 1 and 3, the upper and lower surfaces of chambers **14** define the extent of the upper layer **11** as the portion thereof that lay between parallel tangents t, while the chambers **14'** similarly define the lower layer **13** of the multi-laminar cushion. Conduits **20** are disposed between unsealed portions of sheets **40** and **42** and as such, are incorporated directly into the layer **11** to provide intralayer fluid communication between the contiguous portions of the upper chamber portions **14**. In a similar manner, conduits **20'** provide intralayer fluid communication within layer **13** between the lower chamber portions **14'** of said adjacent cells **12**. The conduits may all be of the same inner diameter (ID) or may vary, as for example, in certain applications in which "bottoming out" is a problem, it may be desirable to have the lower conduits **20'** of somewhat smaller ID than the upper conduits. Generally, conduits **20** and **20'** for use in cushions of this type would have an ID in the range of .0625" (.0246 cm) to 0.25" (.0984 cm). However, it should be recognized that in larger structures, such as mattresses, in which each of the cells comprise chambers of much greater cross-section and volume than depicted herein for cushion structures. The intralayer fluid communication need not be restricted in the manner herein disclosed so long as there is controlled interlayer communication vertically between superposed chambers of such mattresses. Indeed, it has been found that a two-way butterfly-type control orifice **83**, as shown in Fig. 16, may be approximately 0.75" (.295 cm) in diameter which is preferred for this type of application. The orifice **83** comprises an opening of circular configuration **85** which may be partially punched or cut in the throat area of such cells so as to leave the cutout portion of flap **87** in place within the opening **85**. The flap **87** remains attached at opposed peripheral edge portions thereof to the corresponding edges of cutout **83** by tabs **89**. The tabs **89** extend arcuately over varying dimensions depending upon the amount of free opening to be provided for interlayer control of fluid flow between the upper and lower chambers of the mattress.

In order to provide for interlayer fluid communication directly between the upper chamber portions **14** of the cells **12** in layer **11** and between the lower chamber portion **14'**, in layer **13**, orifices or slits **22** are provided in the neck portions **18** of at least some of said cells **12**.

It is an important feature of this invention that there be a substantial differential in the horizontal volumetric flow rate of fluid through the conduits **20** and **20'**, on the one hand, and the vertical flow rate of the fluid through the orifices or slits **22**. In other words, the overall intralayer fluid flow rate and the overall interlayer flow rate are substantially different.

As is well known to those skilled in the art, a downwardly acting force applied to one area of the upper surface of a mattress or cushion-like structure inflated to an appropriate fluid pressure will result in the rapid displacement or "surge" of the fluid from one area of the cushion or mattress to other areas thereof in a wave-like response. Depending on the force applied and the construction of the cushion, or mattress, such surging frequently results in such distortion of the shape thereof sufficient to cause, in some users, feelings of instability

and discomfiture. Other problems associated with use of such cushions, particularly in high impact structures, are known in the art as "rebound" and "bottoming out" and generally are the result of a relatively high impact or impulse being delivered on the outer or upper surface of the cushion. In general, these two phenomena are inversely correlated such that if there is a great deal of "rebound", there would be little or no problem with "bottoming out". In this application, the cushion **10**, when inflated, has some elastic characteristics such that it will absorb a certain amount of energy in changing its shape upon receipt of an impact or impulse and will thereafter restore this energy upon returning to its original shape.

The upper and lower layers **11** and **13**, including, respectively, the chamber portions **14** and **14'** is each formed by selectively sealing together two sheets of heat-sealable thermoplastic material. The vertical axes a, or axes of symmetry of the cells **12** are disposed in equi-spaced lateral and longitudinal relationship over the cushion in a generally uniform dimple-pattern of cells. Each cell is preferably of circular configuration c, as best depicted in Figs. 1-2, but in certain applications, may be rectangular or may be polygonal in configuration. In a sense, the conduits **20** that interconnect adjacent cells 12, form a checkerboard, or grid pattern and the areas delineated by the arcuate portions of adjacent cells result in diamond-shaped areas **26** which, in certain embodiments of this invention, shown in Figs. 10 and 10A, may be cut out or removed to thereby provide open areas **26'** through which temperature-controlled air may be circulated to serve as ventilation for a person resting on the cushion.

In recognition of the fact that comfort is an important feature of the cushion **10** and that the uppermost, or outermost surfaces of the cells **12** provide initial contact with the person's body, it would appear that smoothly curved convex contour of the ellipsoid would be ideal in meeting that criterion. The configuration and support provided by the outer surface of the chambers **14** and **14'** are important for those who are confined to a bed or wheelchair for protracted periods, since such persons tend to develop lesions or bed sores on the portions of their body in contact with the mattress or seat thereof. In the embodiment of Figs. 1-3, the chamber portions are ellipsoidal in configuration but, it will be recognized by those skilled in the art, that the chambers may also be generally spheroidal, ellipsoidal or polygonal in configuration.

The cross-section of each of the conduits **20** and **20'** has a predetermined diameter to provide control of the fluid transfer to and from adjacent upper chambers **14** and lower chambers **14'** of the cells **12** in both the upper and lower layers **11** and **13** of the cushion to thereby control the rates of the fluid flow between each of the cells **12** of the cushion. Such control of the lateral or intralayer fluid transfer between the cells **12** provides a buffering or dampening action to the reaction of the fluid in the cells when an external force is applied to the outer surface thereof. The extent of this buffering action can be varied by changing the cross-sectional areas of the conduits **20** and **20'**. Depending upon the application, the cross-section of said conduits may vary throughout the cushion if, for instance, the application requires the cells **12** of one portion of the cushion to have a greater dampening effect than the cells of another portion.

Interlayer fluid communication vertically between upper and lower chambers **14** and **14'** of the cells **12**, is also provided for further buffering fluid flow as a result of a force being applied to the surface of the cushion. Depending on the particular application and the degree of buffering required, the orifices may be provided through merely some of the cells **12** of the cushion. Moreover, the increase of pressure in the lower chambers **14'** add support to the upper chambers **14**, thus reducing the problem of "bottoming out" of the cushion.

As depicted in the graphic illustration of Fig. 14, the orifices **22**, each of which is preferably formed as a slit. Generally, each of the orifices **22** is substantially smaller than the cross-sectional area than the area of the conduits **20'** such that vertical, or interlayer volumetric rate of flow within the cells and between layers is substantially less than the horizontal or intralayer volumetric rate of flow in the conduits **20** and **20'** of the cushion. It is also within the scope of this invention that the overall cross-sectional area of the orifices that control vertical interlayer fluid flow between the upper and lower chambers **14** and **14'** of the cells be smaller than the overall cross-sectional area of the conduits **20** which provide for the horizontal intralayer volumetric fluid flow between the upper chambers **14** and between the lower chambers **14'** of adjacent cells **12**. Indeed, it has been found that such controlled transference of the fluid to the lower chambers **14'** increase the dampening or buffering response of the cushion to an external force applied to the outer surface thereof.

Cushions of the type embodying this invention are illustrated at **10** in Fig. 1 and preferably are formed, as depicted in Fig. 4, in a single sealing operation by selective sealing of a first pair of thermoplastic sheets **40** and **42** which form the upper layer **11** and a second pair of identical sheets **40'** and **42'** which form the lower layer **13** of the cushion.

In the sealing operation, each pair of thermoplastic sheets **40** and **42** and **40'** and **42'** are superimposed in face-to-face relation on sealing dies which generally replicate the horizontal pattern of the cells, as shown in Fig. 2. The dies may be of any suitable type, such as utilize RF or thermal energy to seal the sheets peripherally and at other uncoated locations preselected for sealing. The inner surfaces **50** of each of the outer sheets **40** and **40'** are coated with release material **44** which will prevent the sealing together of those portions of the sheets **43** that conform to the location of the upper and lower chambers of the cells **12** and the conduits **20** and **20'**. The inner surface **54** of the intermediate sheet **42'** is coated with release material **44** which will prevent

the sealing together of [illegible] portion **47** of the sheets **42** and **42'** about the area **45** through which the orifices are to be formed. The orifices **22** are cut into the intermediate layers **42** at predetermined locations prior to the sealing procedure.

The barrier coating or release material **44** may be applied, such as disclosed in my earlier U.S. Patent No. 5,022,109, by conventional printing techniques, such as silk screening, rotogravure of flexographic process. Preferably, the coatings are applied as a composition in a liquid dispersion medium of an organic solvent or water base with a dispersed phase of finely divided microscopic particles of a polyethylene, a polytetrafluoroethylene (Teflon) or silicone on the order of five microns in diameter. With the release material firmly bonded to the sheets **40**, **40'** and **42'**, the polyethylene, Teflon or silicone particles thereof will inhibit the sealing of the coated areas in the abutted portions of the two sheets engaged by the sealing dies.

The outer seal **46** welds or fuses the outer sheet **40** and **40'** to the intermediate sheets **42** and **42'** to form upper and lower chambers **14** and **14'** of the cells and the inner seal **48** seals the intermediate sheets **42** and **42'** together to thereby connect the upper and lower chambers to form the cells' hourglass shape.

The inflation means, as shown, is in the form of a tube **24** that may be sealed to an opening in the cushion during manufacture of the cushion. In addition, it is also feasible and within the context of this invention, to utilize a one-way check valve capable of serving as an inflation portion for the cushion.

An alternative embodiment of the cushion **10**, as illustrated in Fig. 5, has cells **12** of various sizes or diameters. The firmness of a particular chamber of a cell is inversely proportional to the volume thereof, therefore, the larger sized chambers **60** provide a softer cushion than the smaller sized chambers **62**. Chambers of various sizes may be strategically disposed to provide a firmer or softer cushioned area. In addition, the convex surface of the larger chambers expand to a greater height above the horizontal surface of the cushion than the convex surface of the smaller chambers. The larger chambers may be disposed along the outer edges of the cushion, as shown in Fig. 5, to cradle an individual sitting thereon.

In the embodiment of Figs. 6 and 7, the conduits **20** and **20'** interconnect adjacent upper and lower chambers **14** and **14'** to form individual rows of communicating chambers. The rows of upper chambers are oriented perpendicular to the rows of lower chambers. The control orifices **22** are disposed within the cells along two adjacent edges of the cushion **10** to permit fluid communication between all chambers.

It has been found that by configuring the conduits **20** and **20'**, as shown in Figs. 6 and 7, the dampening or buffering of the transference of fluid can be increased to provide a more stable cushion **10**. The time to transfer the fluid and equalize the pressure throughout the cushion is increased due to the limited number of fluid paths. To equalize the pressure after a downward force has been applied to an upper chamber, the fluid first flows to the upper chambers **14** disposed in its row, then passes through an orifice **22** to a row of lower chambers **14'**, then back through the orifices **22** in the said row to the remaining rows of upper chambers **14**, and finally back through the remaining orifices to the remaining rows of lower chambers.

In the embodiment illustrated in Figs. 8 and 9, the outer layers **40** are sealed along the outer periphery of the cushion at **80** to form an intermediate chamber **82** defined by the void between the cells **12**. The intermediate chamber may be filled or inflated with a fluid such as air, liquid or gel by an inflation means **24'**. The intermediate layer may also be inflated at a high pressure and the cells be inflated at a relatively low pressure to form a generally firm cushion with a softer upper surface. Inflation of the intermediate layer also reduces the likelihood of the cushion from "bottoming out".

Due to the long periods of contact with the cushion **10**, a significant amount of heat can build up causing the body of the user contacting the cushion to perspire. The embodiment in Figs. 10 and 10A illustrates a means to ventilate the cushion, as briefly discussed hereinbefore. The diamond-shaped portions **26'** of the cushion **10** interposed between the cells **12** are cut out to permit air to pass between the user and cushion. The cushion **10** acts as a pump by drawing air into the void **26'** between the cells **12** when the cells inflate and forcing air from the void through the cutouts **26'** when the cells are compressed.

The embodiments in Figs. 11 and 12 show a cushion **10** having three inflatable layers **11**, **12** and **94** comprising a plurality of adjacent cells having three vertically stacked chambers. The third or bottom chamber **14"** may communicate with the other two chambers **14** and **14'** to increase the dampening of the cushion or may be isolated therefrom to permit the third layer to be independently inflated to provide a firm base cushion and reduce the likelihood of "bottoming out".

Fig. 13 illustrates another embodiment of the invention having the cells **12** with square-shaped chambers in abutting relationship such that no spaces **26** exists therebetween as shown in Fig. 1.

The cells **12** of the cushion **10** may be interconnected to provide separate zones of inflation **95**, **96** and **97**, as shown in the embodiment in Fig. 15. This feature is important for applications which require portions of the cushion to be of greater pressure than others. For instance, a cushion used as an inner sole of a shoe may require a firm cushion at the heel of the foot and a softer cushion at its forefoot or arch.

Although the invention has been shown and described with respect to an exemplary embodiment thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions, and additions in the form and detail thereof may be

made therein without departing from the spirit and scope of the invention.

Claims

1. An inflatable, multi-layer body support cushion (10) defined by a plurality of fluid filled cells (12) formed by layers (11, 13) of flexible sheet material, characterised in that said cells (12) being of sufficient height to extend over at least two of said layers and comprising inflated chambers (14, 14') disposed in vertically stacked and abutted relation to each other, said layers (11, 13) each comprising a substantial number of said chambers (14, 14') arranged in adjacent side-by-side relation to each other, orifices (22) disposed to provide predetermined volumetric flow rate for controlled interlayer fluid communication between at least some of the vertically stacked chambers (14, 14') when said cells (12) are subjected to a compressive load.

2. An inflatable, multi-layer body support cushion (10), as set forth in Claim 1, characterised in that at least some of said adjacent chambers (14, 14') are interconnected by conduits (20) which provide intralayer fluid communication therebetween, the cross-sectional area of said conduits (20) being related to the cross-section area of said orifices (22) such that in response to said compressive load being applied to an upper surface portion of said cushion (10), the intralayer volumetric flow rate and the interlayer flow rate between the chambers (14, 14') of said cells (12) are controlled to buffer the internal fluid in response of said cushion (10) to said load.

3. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that said cushion (10) is permanently inflated so that it need not be reinflated during the intended use thereof.

4. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that areas (26) between contiguous chambers (14, 14') in each of said layers (11, 13) are perforated to provide paths for the passage of air into, through and out of said cushion (10) to provide ventilation to the portion of the body disposed thereon.

5. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that said cushion (10) includes means (24) for inflating the chambers (14, 14') of said cushion (10).

6. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that said cushion (10) comprises a mattress and separate inflatable zones (95, 96, 97), each being provided to control the inflation of the chambers (14, 14') in said zones (95, 96, 97).

7. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that said chambers (14, 14') are spheroidal, ellipsoidal or polygonal in shape.

8. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that said chambers (14, 14') vary in size in different areas of the cushion (10).

9. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, characterised in that said layers (11, 13) of sheet material are sealed about the outer peripheral edges (80) thereof to form a generally closed chamber (82) between the inflatable layers (11, 13) of said cushion (10).

10. An inflatable, multi-layer body support cushion (10), as set forth in Claims 1 or 2, further characterised in that an inflation control means for alternately inflating different cells (12) of said cushion (10) in sequential timed relationship for varying the pressure points on a body resting on said cushion (10).

11. An improved method for producing an inflatable, multi-layer body support cushion (10) having a plurality of fluid filled cells (12) formed by layers (11, 13) of flexible sheet materials, characterised by the steps of selectively coating a plurality of sheets (40, 40', 42, 42') of fusible synthetic plastic material with a barrier material (44) at predetermined areas (43, 47) to prevent said layers (11, 13) at said areas from sealing together at locations to provide air flow conduits (20) of predetermined cross-section and configuration, providing orifices (22) at predetermined locations through at least one of said sheets (40, 40', 42, 42'), stacking said sheet material (40, 40', 42, 42') in superimposed relation, simultaneously sealing said sheet material (40, 40', 42, 42') about the outer periphery thereof, about said cells (12) and about the area centrally disposed in said cells (12).

12. An inflatable cushion (10) comprising first and second layers (11,13), each layer comprising a plurality of compartments (14,14') which in use are filled with fluid, each compartment being in fluid communication with an adjacent compartment in the same layer, and at least one compartment in the first layer being in fluid communication with a compartment in the second layer, wherein the volumetric flow rate of fluid between compartments in the same layer is different to that between compartments in different layers when the cushion is subjected to a compres-

sive load.

13. An inflatable cushion (10) according to claim 12 in which the volumetric flow rate of fluid between compartments in different layers is substantially less than that between compartments in the same layer.

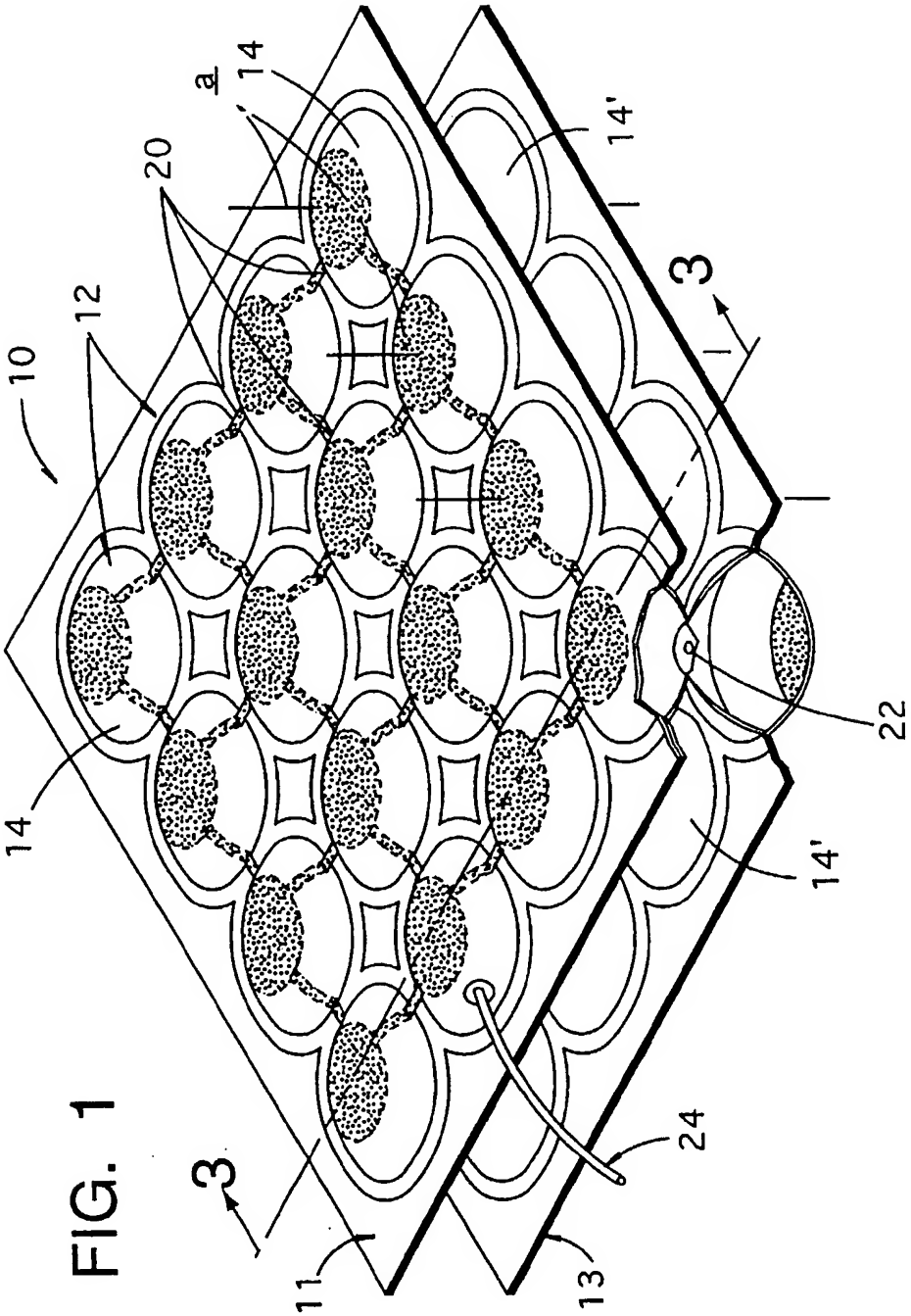


FIG. 1

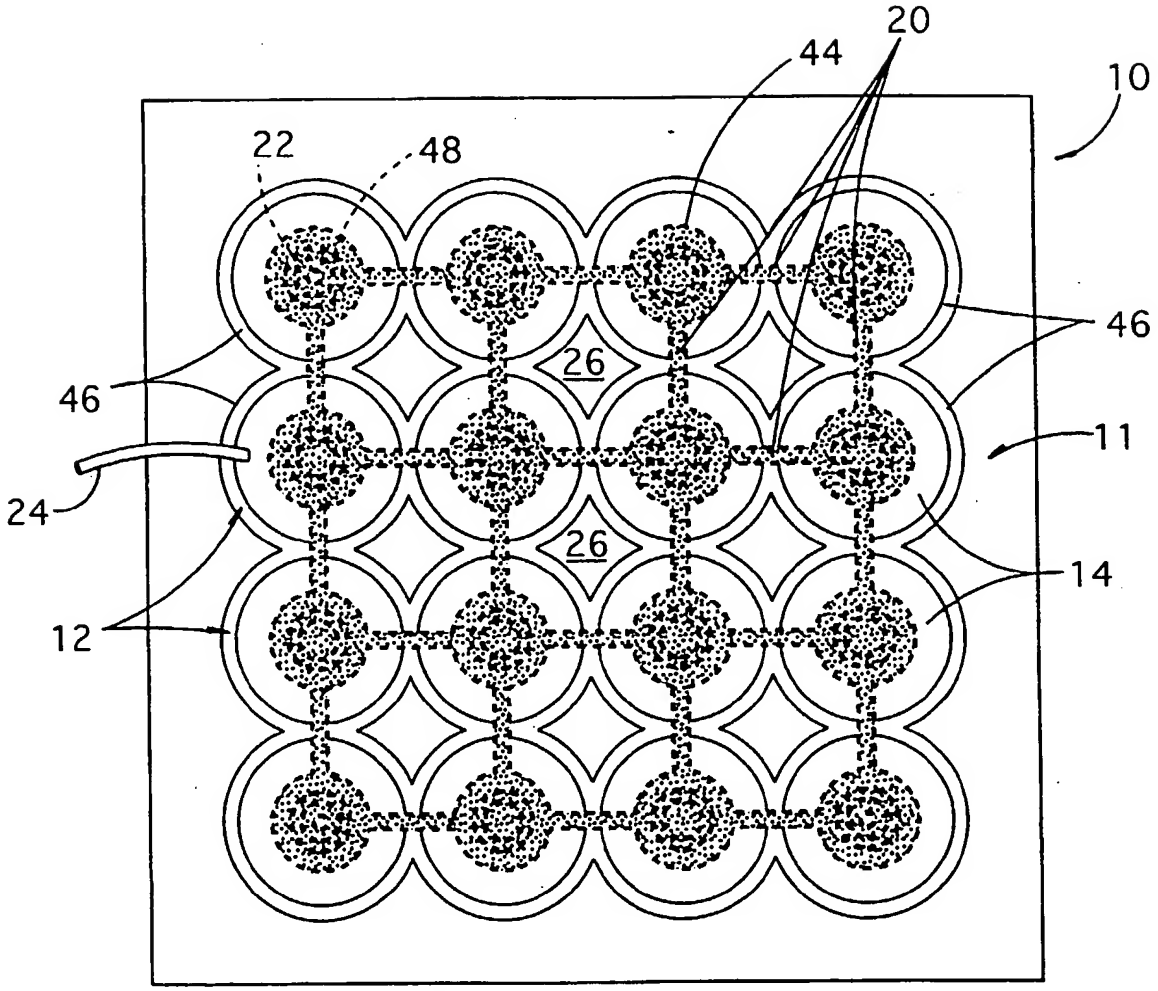


FIG. 2

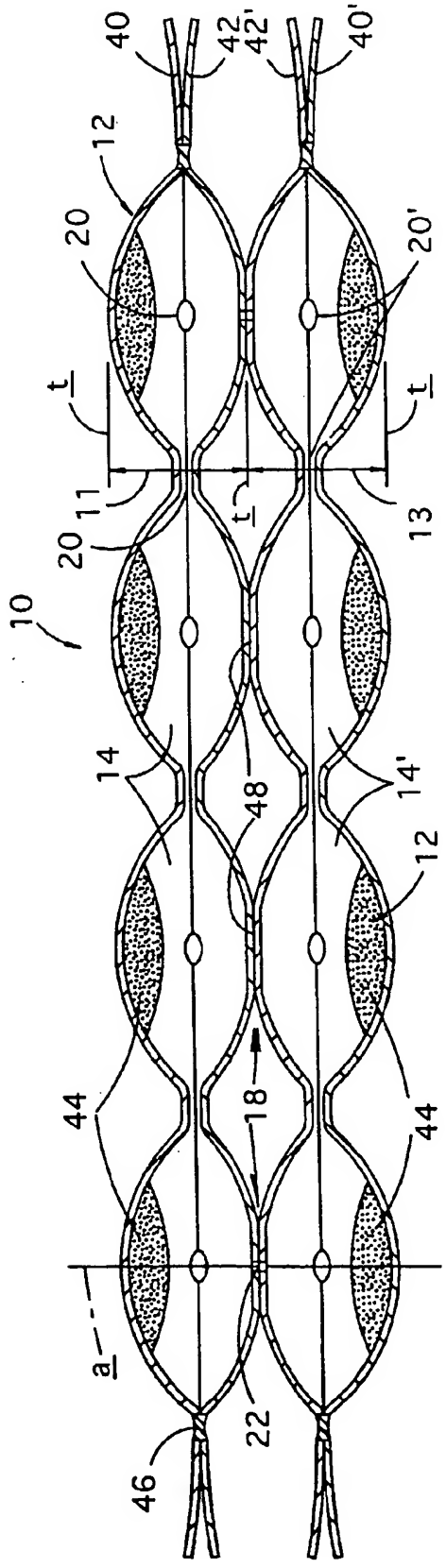
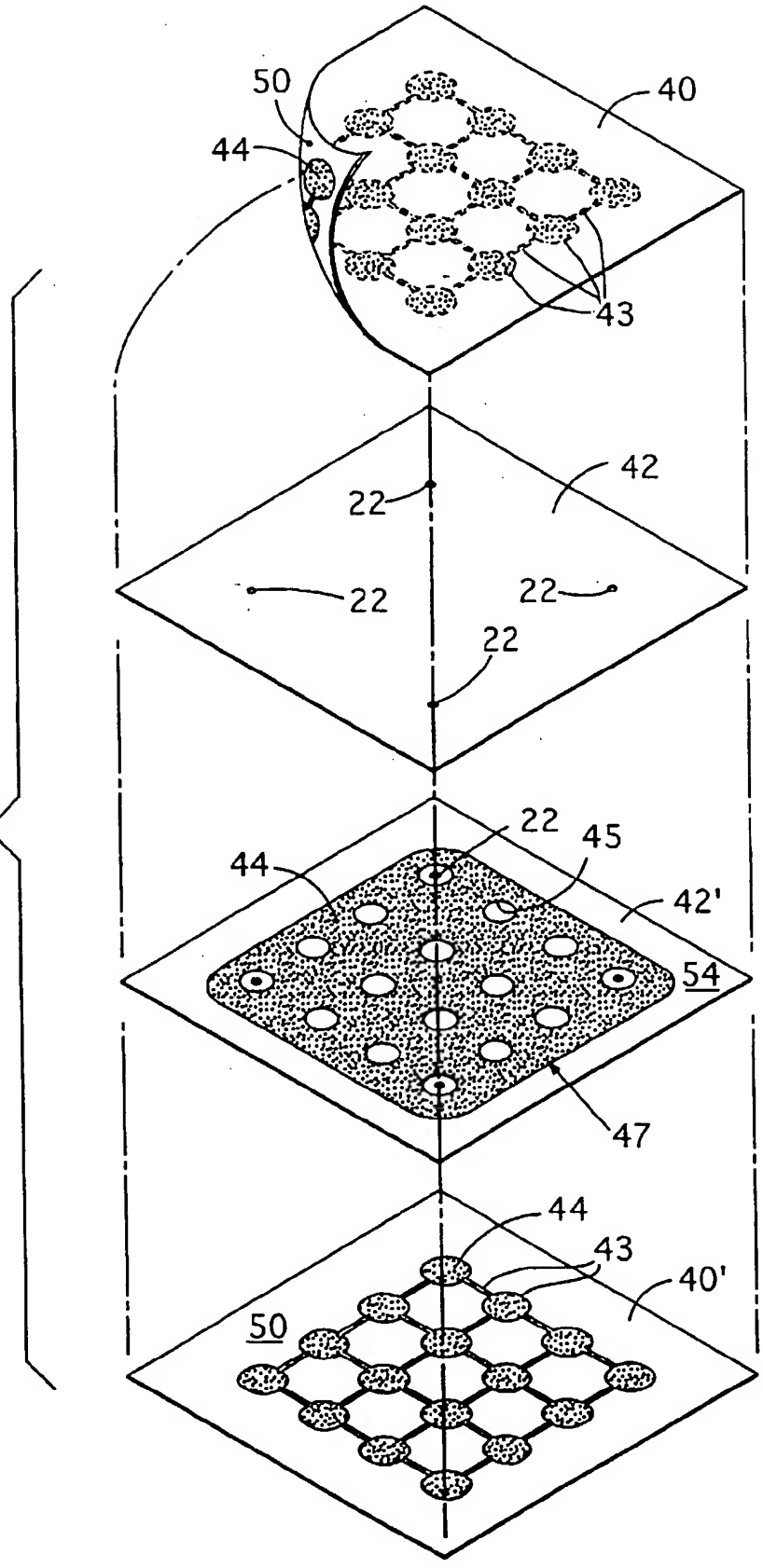


FIG. 3

FIG. 4



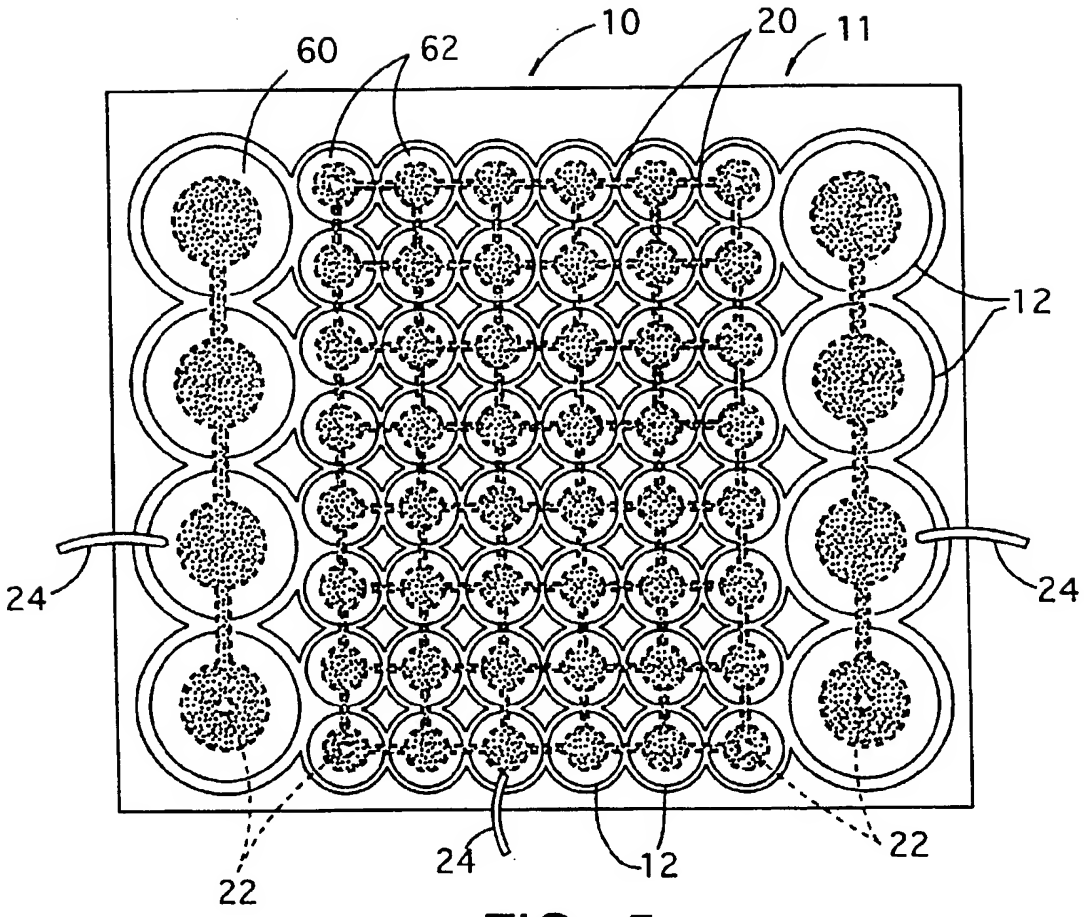


FIG. 5

FIG. 6

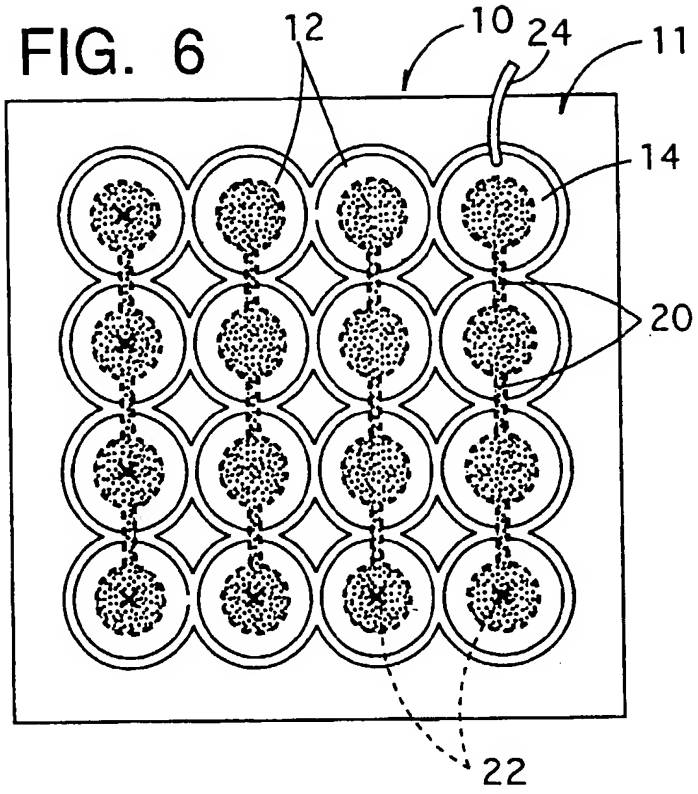
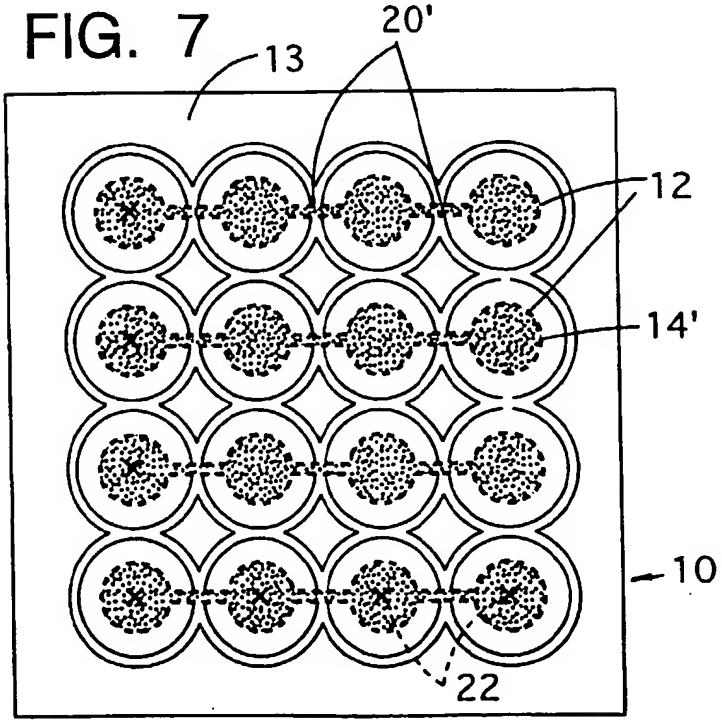


FIG. 7



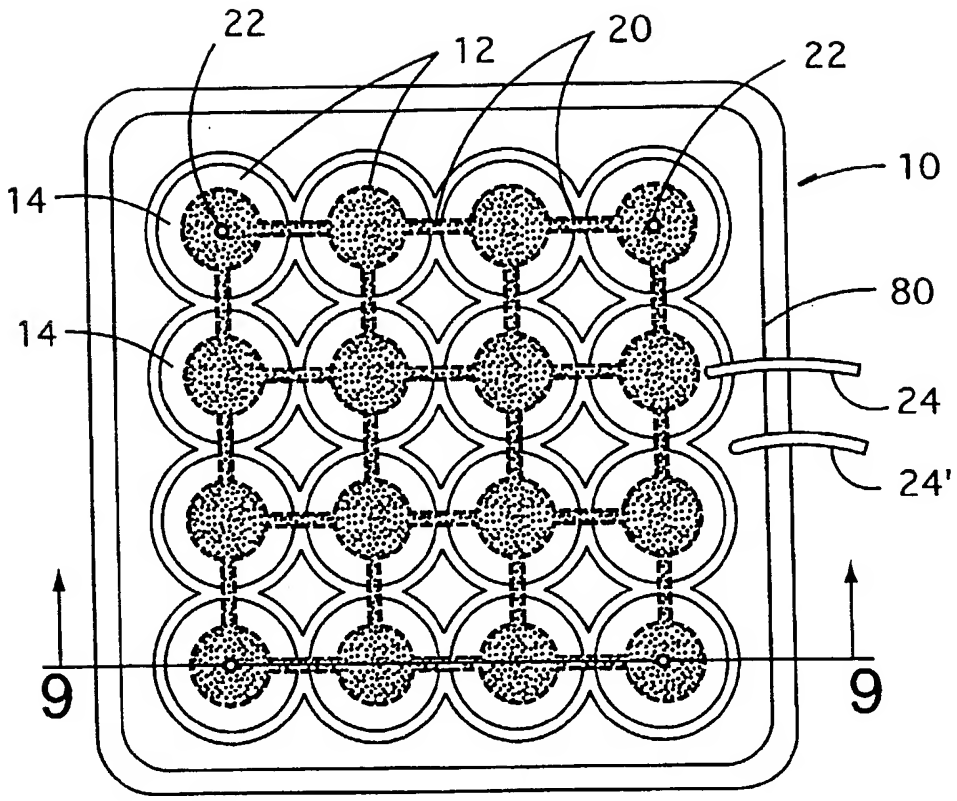


FIG. 8

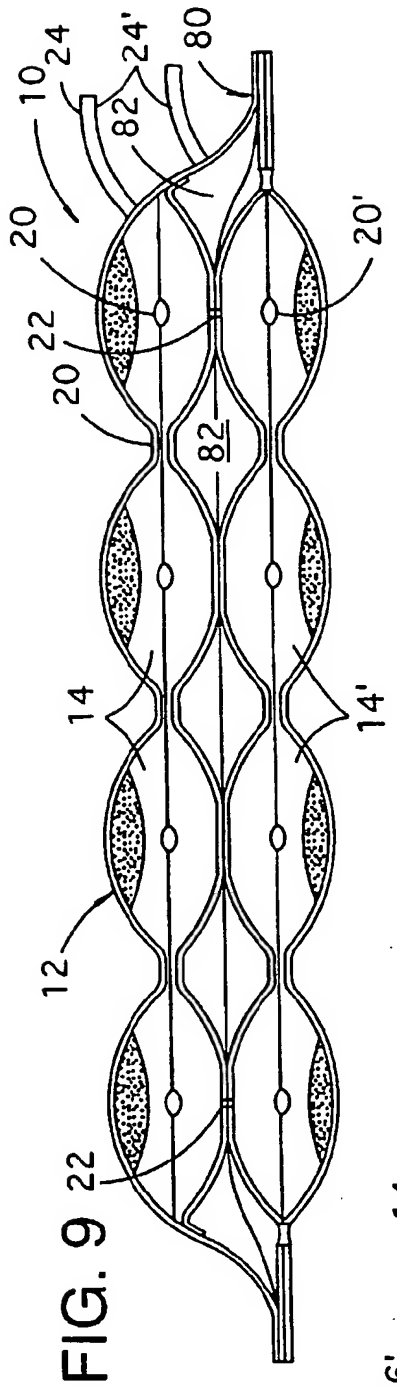


FIG. 9

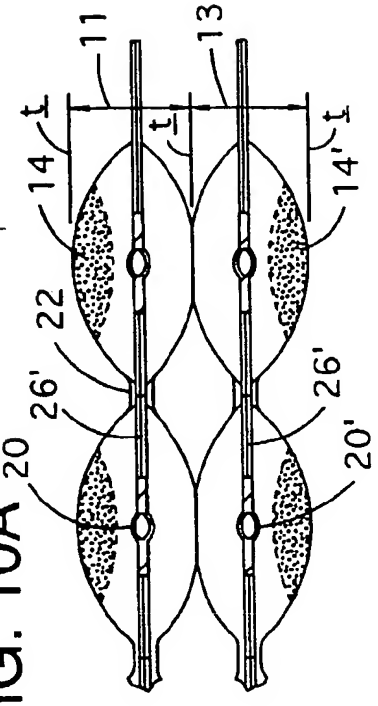


FIG. 10A

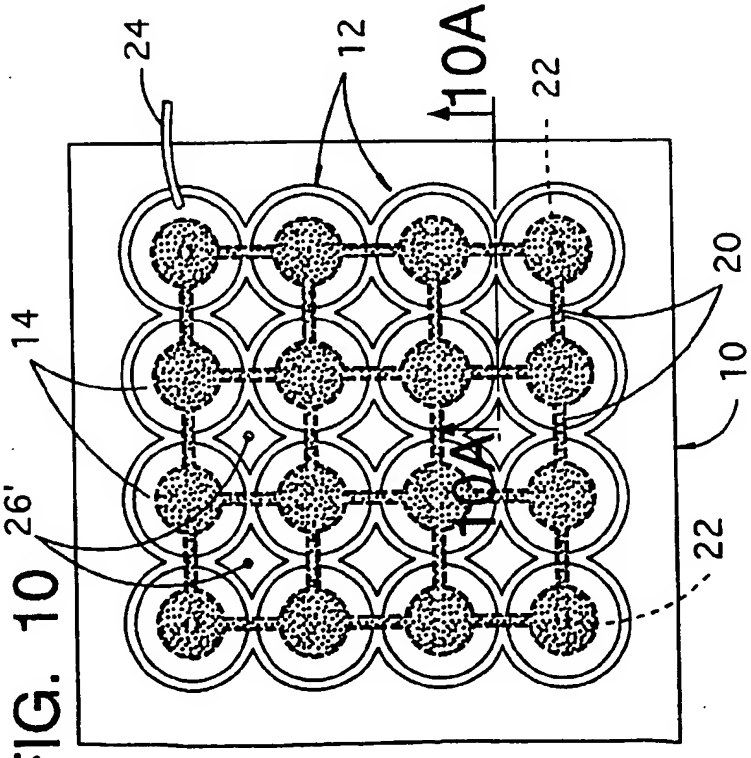


FIG. 10

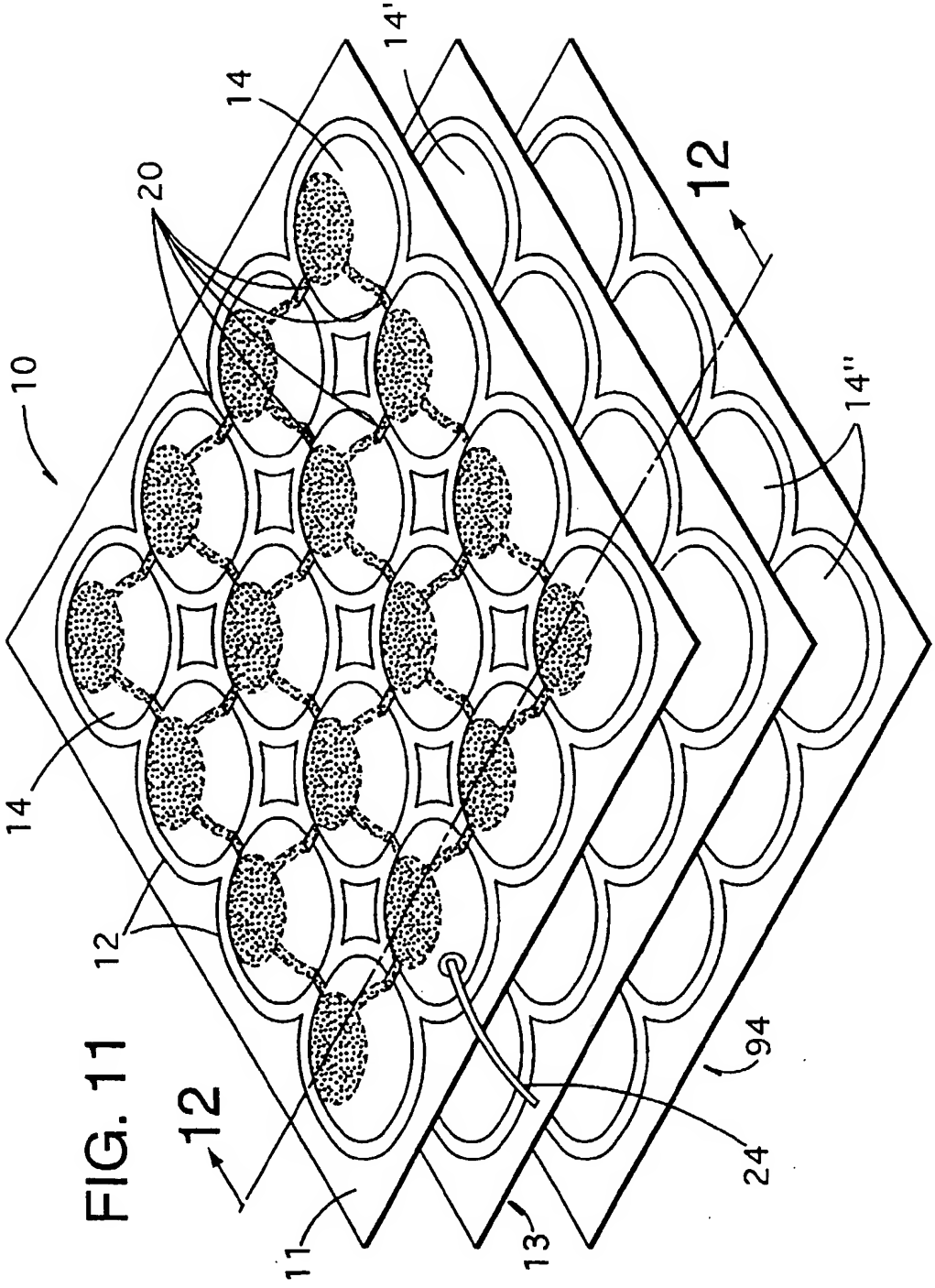


FIG. 11

FIG. 12

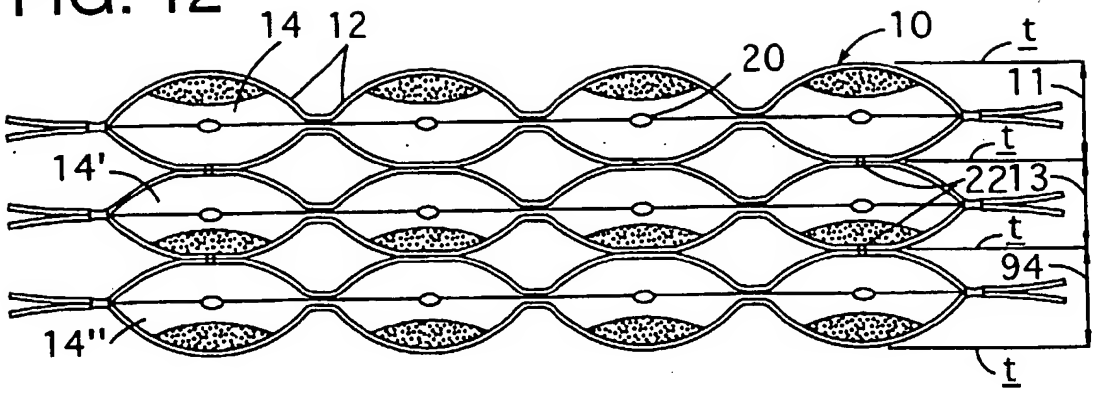
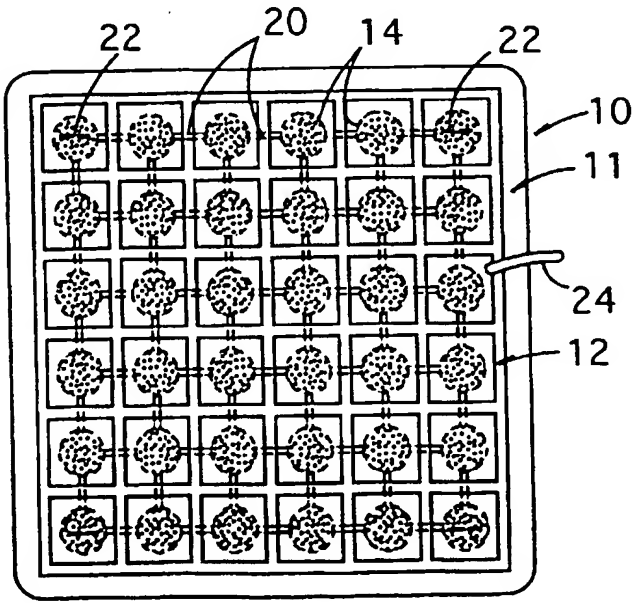


FIG. 13



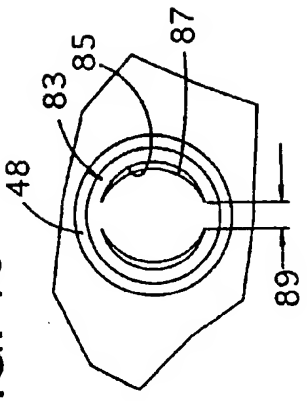


FIG. 16

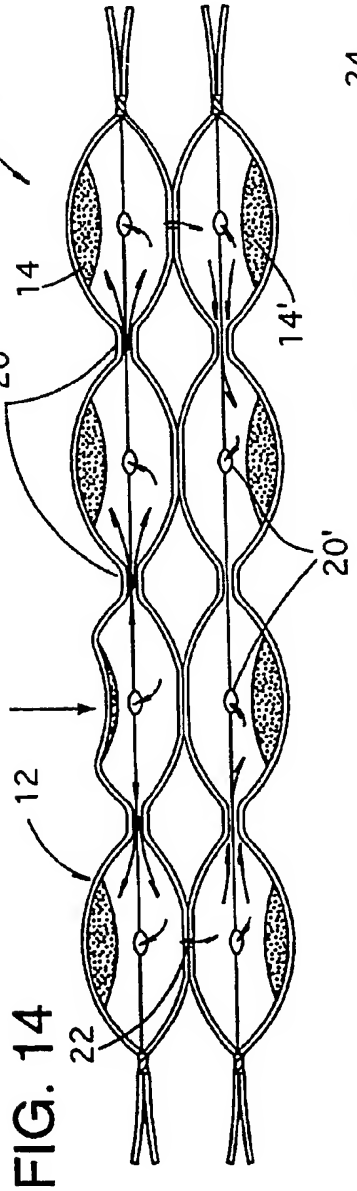


FIG. 14

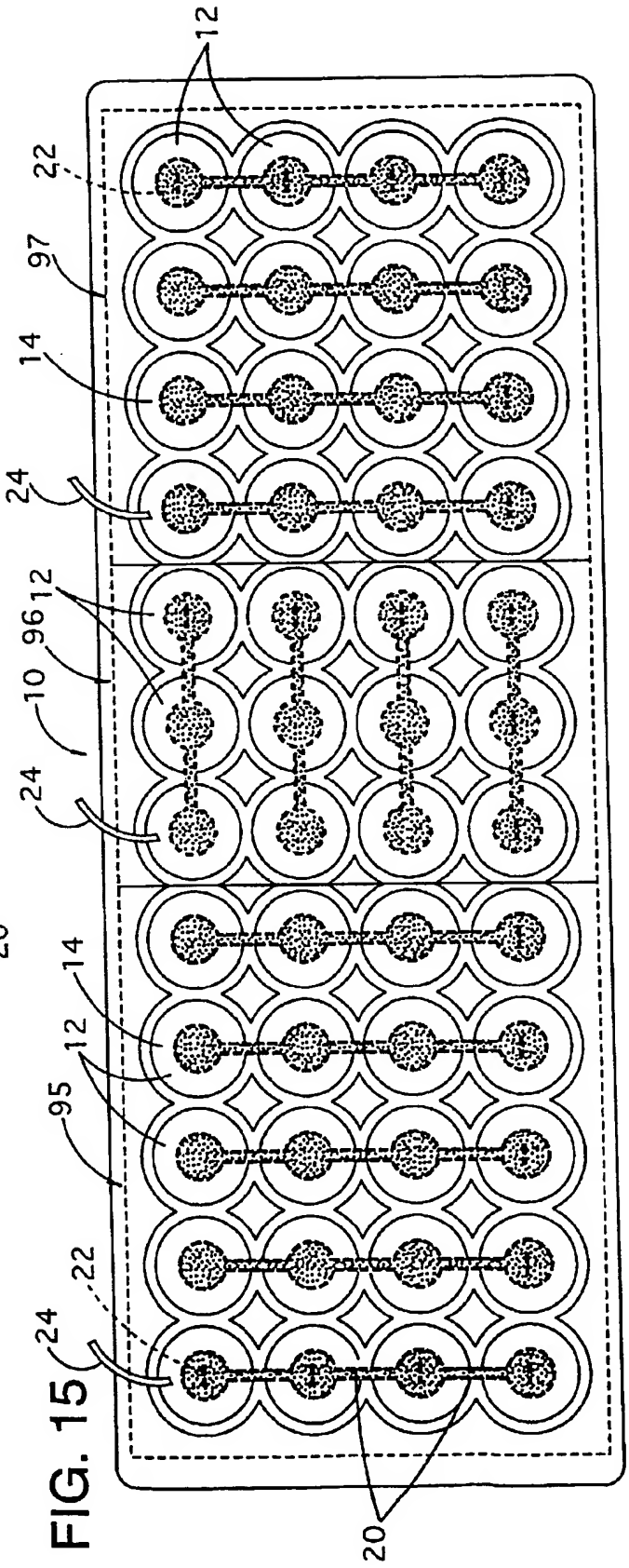


FIG. 15

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 2415

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	US-A-2 495 124 (MORNER) * the whole document *	1,7,9, 11,12	A47C27/08
A	US-A-4 483 030 (FLICK ET AL.) * column 3, line 18 - column 8, line 5; figures 1-5 *	1,3,5,9, 11,12	
A	GB-A-1 035 490 (SIDEBOTTOM) * the whole document *	1	
A	GB-A-2 156 209 (WANG) * page 1, line 61 - line 78; figure 4 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A47C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 July 1996	Mysliwetz, W

CATEGORY OF CITED DOCUMENTS

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